LabState version 1.0
A Graphic State Notation Program for Animal Behavioral Study

User's Guide to Software

AniLab Software & Instruments Co., Ltd.
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TABLE of CONENTS

1.Introduction 1
2. Software Installation 2
3. View windows 4
4. System Configuration 6
    4.1 I/O Interface 6
    4.2 Cage Device 6
    4.3 Video Device 7
    4.4 Sound Device 7
    4.5 Weight Signal 8
    4.6 Touch-Screen 8
5. Run an Experiment 9
    5.1 Edit experimental animal 9
    5.2 Edit experimental method 10
    5.3 Run a cage 11
6. Data Files 12

1.Introduction

LabState (renamed from AniLab ver 6.54) is a graphic state notation program designed to control devices for laboratory animal behavioral research. Its principle function is to control operant chambers. These devices include standard digital "ON/OFF" apparatus, such as:

- digital input devices (levers, nose pokes, infrared detectors, etc.)
- digital output devices (lights, infusion pumps, etc.)

However, unlike most operant control systems, LabState also supports video image analysis. Animal's moving or position signal can be used in behavioral experiments such as:

- video tracking: locomotion activity, conditioned place preference/aversion, light/dark box, shuttle box, etc.
- global activity: immobility analysis such as conditioned fear, forced swim test, tail suspension test, etc.

LabState can also control analog devices, such as:

- weight signal (food intake monitoring)
- pressure response signal (acoustic startle reflex)

and other devices:

- keyboard and mouse input
- audio output (acoustic startle reflex)
- touchscreen input (used for CANTAB tasks)
- graphical output on multiple computer monitors (used for CANTAB tasks)

LabState is the underlying platform that runs some of the most popular behavioral tasks and task suites in use today. So, if you want to write your own behavioral tasks, you can do so using LabState.

Features

- was specifically designed to make behavioral programming simple, reliable and fast, by using a graphic user-interface;
- timing of events such as lever presses is with accuracy of millisecond range;
- runs up to or more than 16 boxes simultaneously, each box runs its own task independently;
- runs on cheap, standard hardware (generic PCs, sound, video, and I/O cards);
- uses a standard operating system (windows 98/ME/2000/XP/VISTA/WIN7/WIN8).

About State notation:

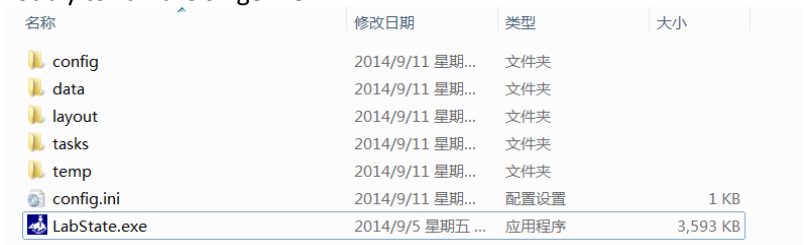
State notation has been increasingly utilized to describe and implement behavioral procedures since its adaptation for this purpose in 1970. The original version describes states as unique segments of an experimental procedure, accompanied by specified stimulus conditions. Transitions among states are triggered by inputs from the subject, or by the passage of time, and may be the occasion for changing stimulus conditions, recording data, or per-forming other operations. Extensive usage has suggested a number of possible improvements, and the notation therefore has been expanded and modified. Revisions recently incorporated in state notation increase its power as a descriptive device for effectively communicating the procedural details of reinforcement contingencies. *Arthur G. Snapper, Ronald M. Kadden, Geoffrey B. Inglis. State notation of behavioral procedures. Behavior Research Methods & Instrumentation. May 1982, Volume 14, Issue 3, pp 329-342*

2. Software Installation

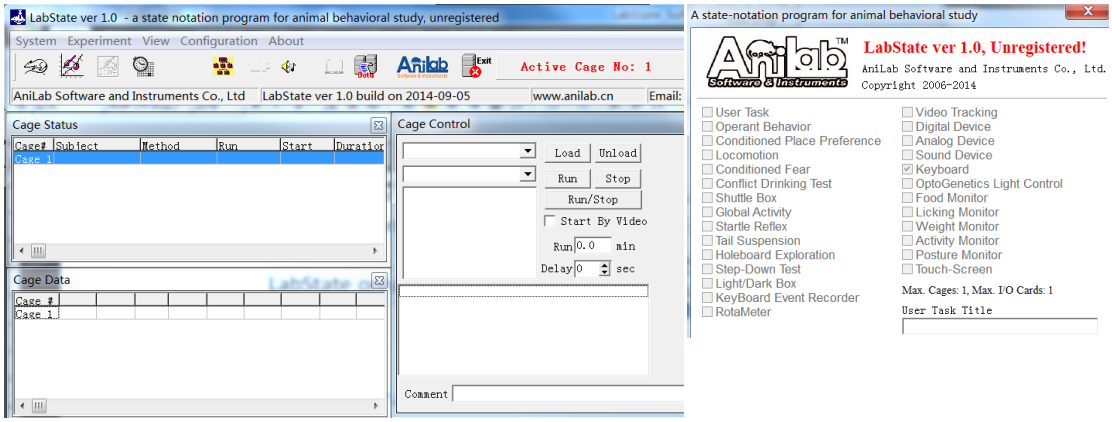
LabState is a portable Windows application (also called standalone application), a program designed to run on a compatible computer without being installed in a way that modifies the computer's configuration information. LabState does not write to the Windows registry or store its configuration files (such as an INI file) in the user's profile; instead, it stores its configuration files in the program's directory.

LabState only contains one executable file: LabState.exe (size 3.6Mb).

When you run this file, it will automatically create some directories and configuration files. So do not try to run the singe file.

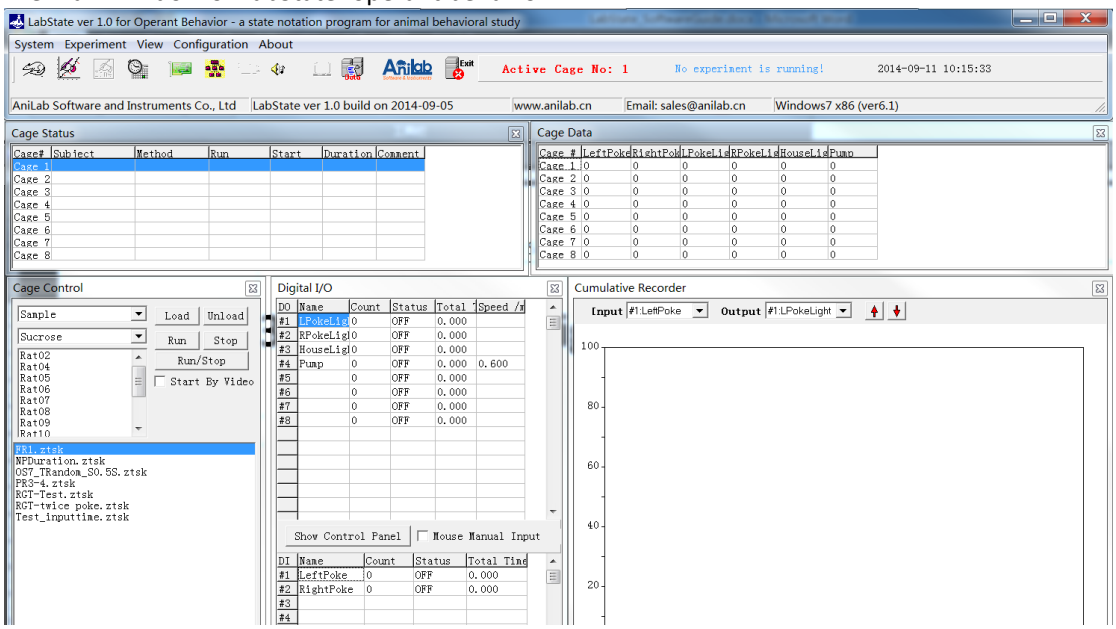


A license file (license.dat) or a USB-key is needed to register for selected functions. AniLab will distribute this program in a fully functional copy with directories and configuration files.



The distributed files look like:

The main window of LabState: operant behavior



Directories:
\config: cage and I/O interface card configuration files
\data: all experimental data are saved here
\layout: sub windows arrangements
\sound: sound device configuration and wave files (need license)
\tasks: experimental method (tasks) files
\temp: when a cage is running, the temporary data files stored here and deleted when the cage is stopped.
\video: manual started recording of video files (need license)
\zone: video tracking configuration files (need license)

Files:

Labstate.exe: the main program
StateData.exe: a data program to view the general data for operant tasks.
Config.ini: a text file for system configuration.
Layout.ini: a text file to save the viewing windows arrangements
Camera.cfg: video grabber or camera configuration
License.dat: for registration

Config.ini can be opened using the Notepad:
[File]
Cage=cage.box
Card=io.card

In this example:
Cage= specified the cage configuration file is /config/cage.box
Card= specified the i/o interface card configuration file is /config/io.card

These configuration files can be edited in the cage configuration window and I/O interface configuration window, respectively. Normal, the configuration has been made by AniLab.

3. View windows

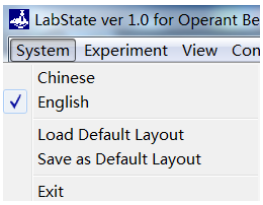
LabState has three kinds of windows:

- **Main window**: the **main window** is always active, close it will terminate the program.
- **View window**: a view window can be opened and closed freely. The open/close status and the position of the a view window will be saved in layout.ini. Next time LabState will start with the same windows arrangements.
- **Setup window**: when a setup or configuration window is opened, all operations are confined to this window, it must be closed in order to make other operations.

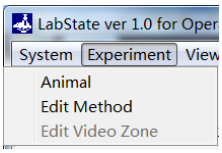
LabState ver 1.0 for Two Bottle Choice - a state notation program for animal behavioral study
System Experiment View Configuration About
Active Cage No: 1
No experiment is running!
2014-09-11 10:20:26
AniLab Software and Instruments Co., Ltd
LabState ver 1.0 build on 2014-09-05
www.anilab.cn
Email: sales@anilab.cn
Windows7 x86 (ver6.1)

You can use the pull-down menu and speed-button of the main window to show the view/configuration windows.

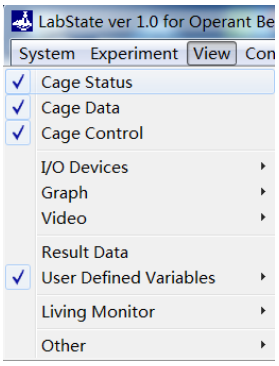
Main Menu:



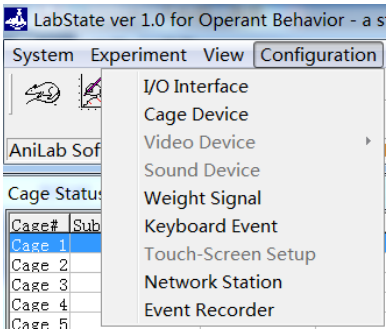
System
-Chinese
-English
-Load default layout
-Save as default layout



Experiment
Animal: open the setup window of animal
Edit method: open the setup window of Experimental Method Editor



View: open the view windows
-Cage status: the running status of cages
-Cage Data: the data when a method is running
Cage Control: load method and start/stop a run
I/O Devices - see sub menu
Graph - see submenu
Video - see submenu
Result Data: default selected data for cage
User Defined Variables: - see submenu
Living Monitor – see submenu
Other – see submenu



Configuration
I/O Interface: configuration of i/o interface card
Cage Device:
Video Device:
Sound Device:
Weigt Signal: for startle reflex
Keyboard Event: define key press
Touchscreen setup:
Network Station: for multi-stations of touch screen
Event Recorder: enable/disable event recording in data file

Sub Menu:

I/O Device

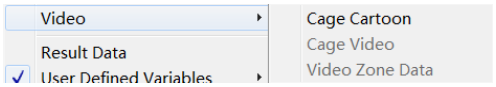
Digital I/O Device: show the status of digital input/output devices, and manual control test for digital outputs.

Analog I/O Device: show the status of analog input/output devices, and manual control test for analog outputs.

Graph

Cumulative Recorder: a software emulating of the traditional cumulative recorder.

Wight Graph: viewing analog data of load cell amplifier, such as used in startle reflex

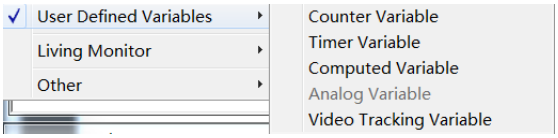


Video

Cage Cartoon: show the position of animal in a conditioned place preference task or shuttle box.

Cage Video: show extracted image of a single cage from the video grabber

Video Zone Data: video tracking data



User Defined Variables: experimental dependent variable defined in a method editor

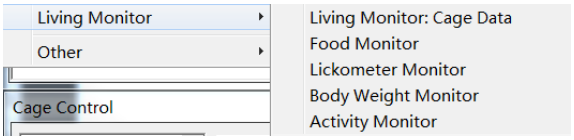
Counter Variable:

Timer Variable:

Computed Variable:

Analog Variable:

Video Tracking Variable:



Living Monitor: continues monitoring

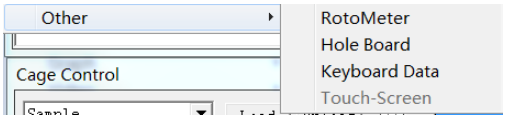
Cage Data:

Food Monitor:

Lickometer Monitor:

Bodyweight Monitor:

Activity Monitor:



Other

Rotometer:

Hole Board:

Keyboard Data:

Touch-Screen;

Speed-Button:

Edit Experimental Animal

Edit experimental Method

Edit Video Tracking Parameter

Running schedule

I/O interface Configuration

Cage Device Configuration

Video Device Configuration

Sound Device Configuration

Show the video image

Load the Data Program

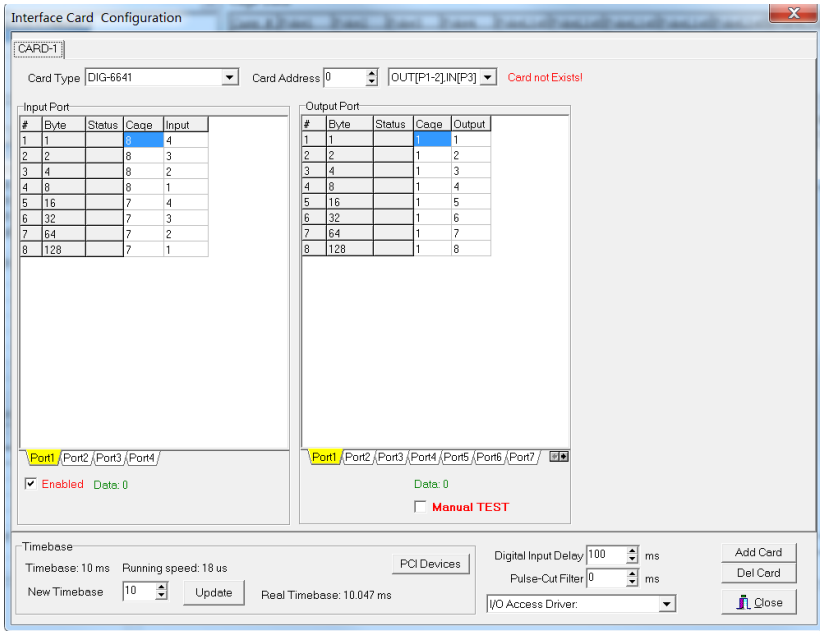
About

Close LabState

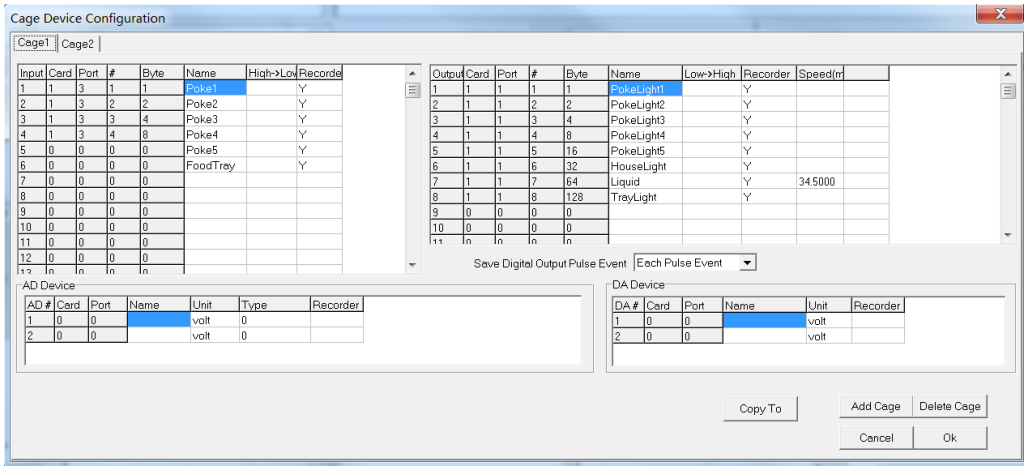
4. System Configuration

LabState is a multi-function program for behavioral study. Different system setup needs configuration dependant upon the kind of experiments. Please refer to separate documents for detailed configurations.

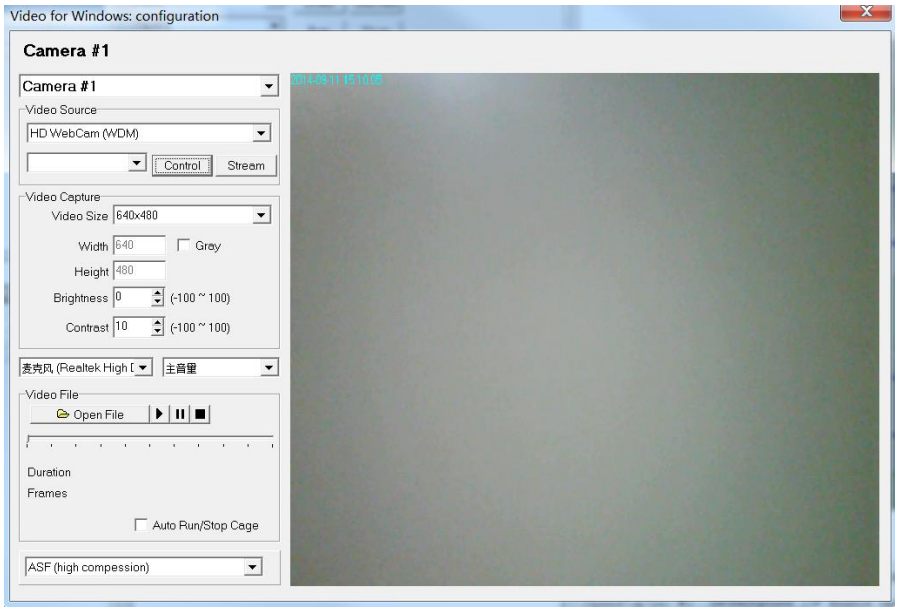
4.1 I/O Interface



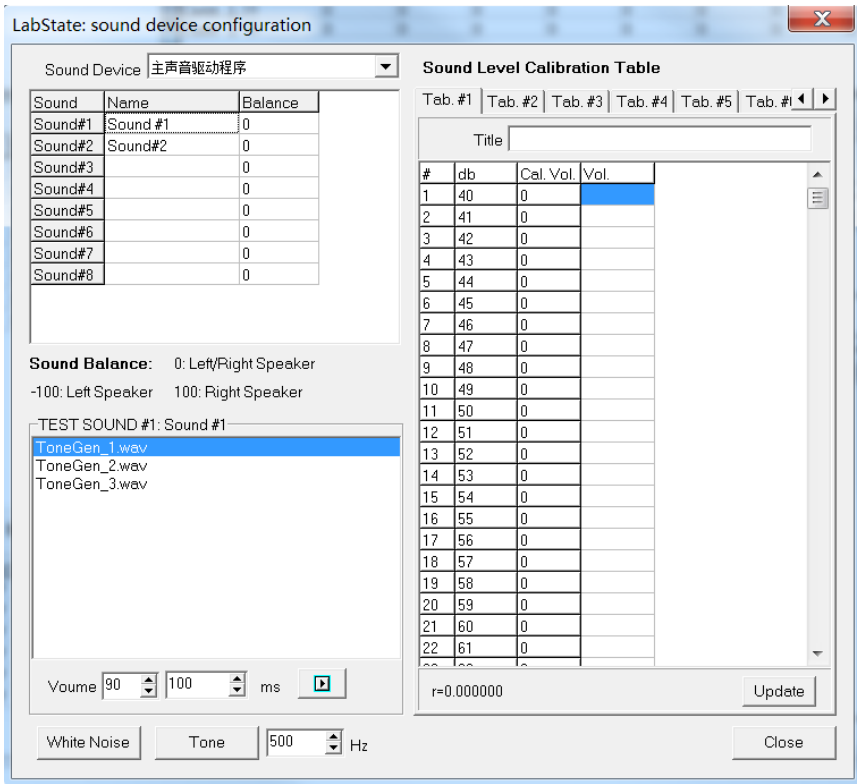
4.2 Cage Device



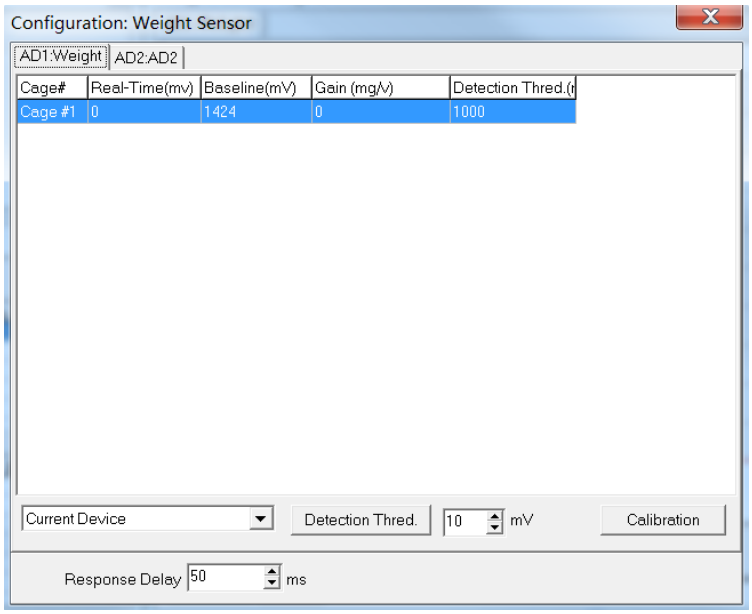
4.3 Video Device



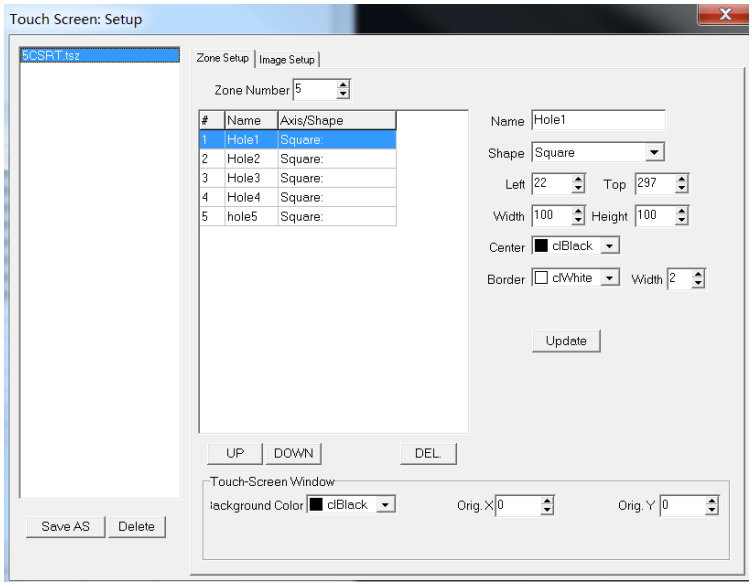
4.4 Sound Device



4.5 Weight Signal



4.6 Touch-Screen



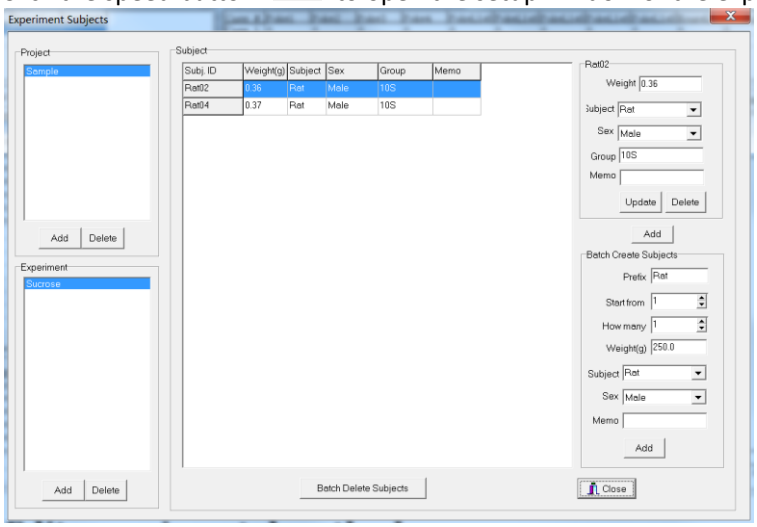
5. Run an Experiment

There are three steps to run an experiment in a cage. First, you should create the experimental subject (animals), then create an experimental method, finally, select an animal and a method, load into a cage and start run.

5.1 Edit experimental animal

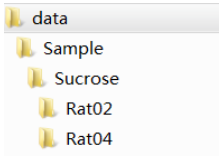
LabState manages the experimental data in three levels: Project, Experiment, Subject, representing in three levels of sub-directories in the \data directory.

Click the speed button to open the setup window of the experiment subjects.

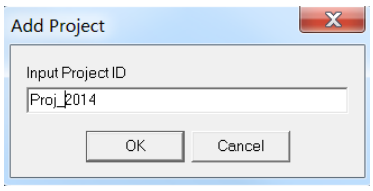


In this sample, there is only one project named "Sample".

The director structure is as follow:



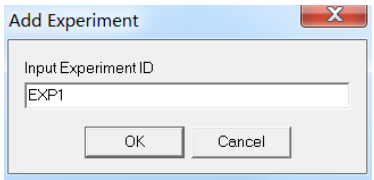
You can add project, experiment and subjects. Click the "add" button in the project panel.



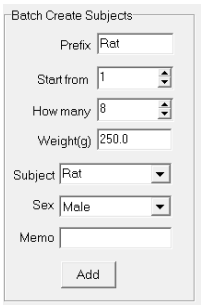
Input a project ID, such as "Proj_2014" and click OK, a sub director \Proj_2014 will be created in the \data directory.

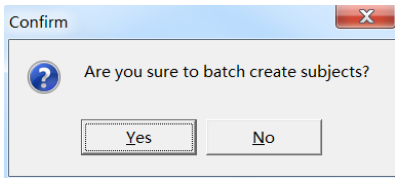
Be sure to obey the rules of directories for the Project ID, Experiment ID and Subject ID. '/', '\', '?', '*' are not allowed for directories.

Select "Proj_2014", and click the "add "button in the experiment panel. Input a experiment ID, such as 'EXP1' and click "OK".

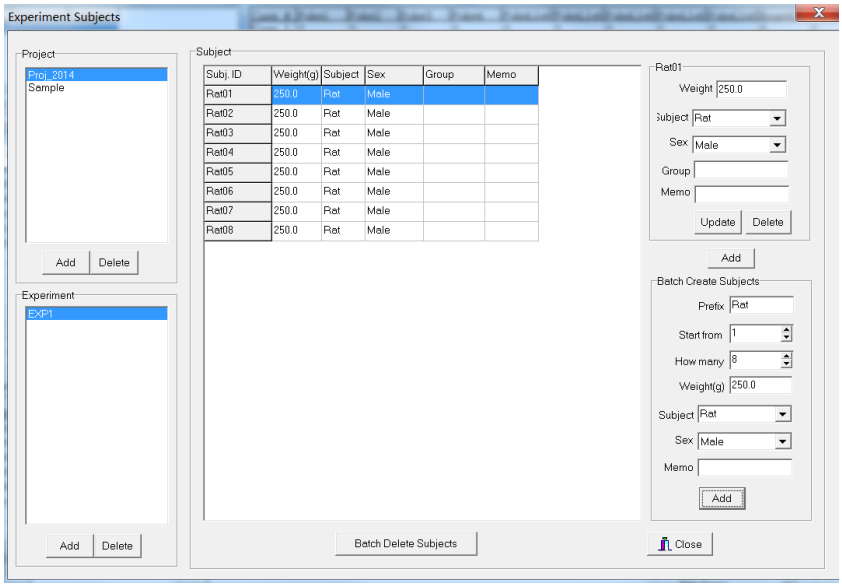


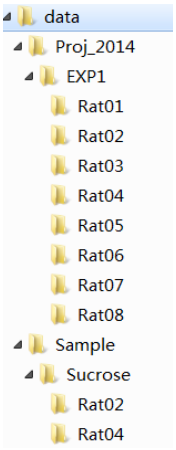
Now we add eight "Rats" in "Proj_2014\EXP1" using the "Batch create subjects" panel. Input 8 for "How many", prefix is "Rat", click the "Add" button.





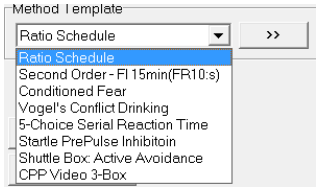
click "YES"



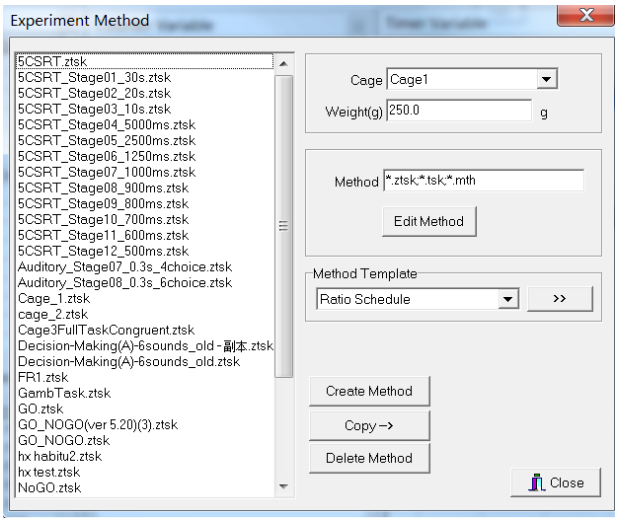


5.2 Edit experimental method

Click the speed button enter the experimental method window. You can create a method, or edit an existing method, or using the "Method Template".

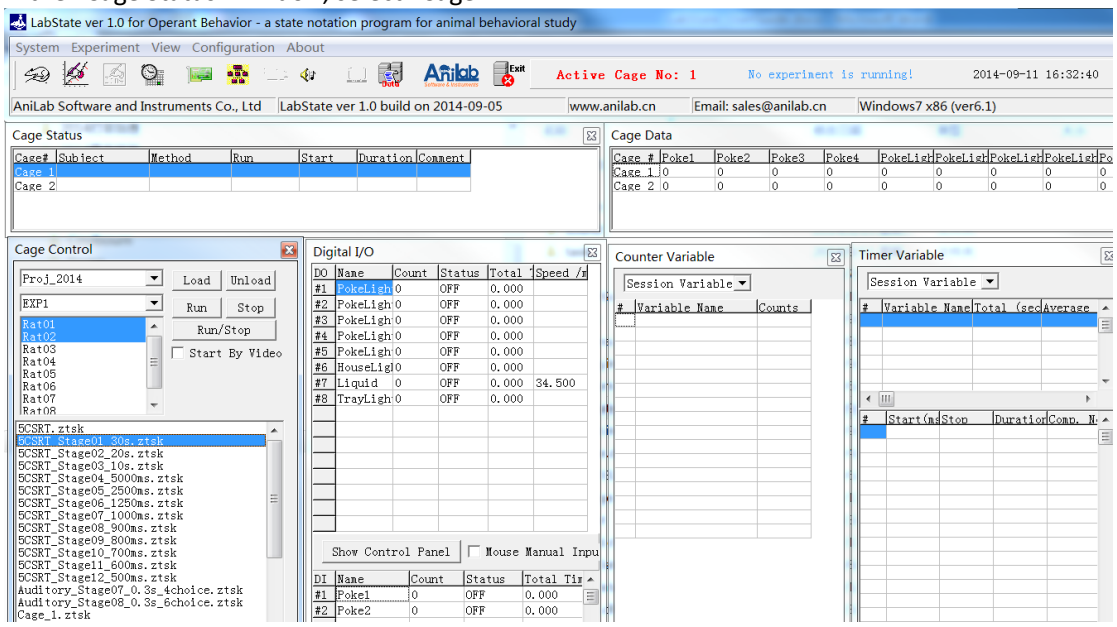


Please refer to "User's Guide to Method Editor' for detailed information.

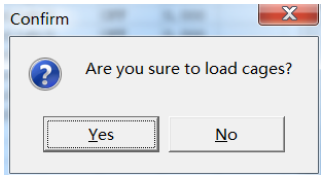


5.3 Run a cage

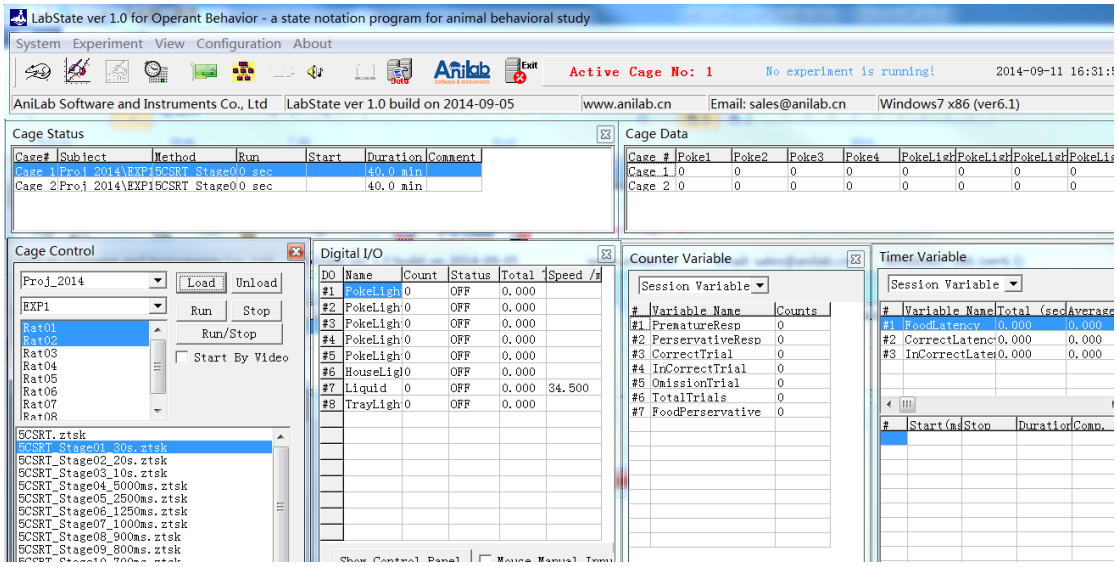
In the "Cage Status" window, select "Cage1".



In the "Cage Control" window, select "Proj_2014\Exp1\Rat01, Rat02", and a method, click the "Load" button.



click "YES"



In the "Cage Control" panel, lick "Run" button.

6. Data Files

Data Programs:

- StateDate.exe: the general data program for operant behavioral study
- LocDate.exe: data program for locomotor activity
- ActData.exe: data program for global activity analysis, such as tail suspension, forced swim test, and fear conditioning.
- CPPDate.exe: data program for conditioned place preference
- StartleDate.exe: data program for acoustic startle reflex
- FearDate.exe: data program for dear conditioning
- UserData.exe: data program for user defined session variables
- TrackVarData.exe: data program for user defined video tracking variables

Data File

The experimental data are saved in the directory of :
\Data\Project ID\Experiment ID\Subject ID\
With a file extension name of '.zdat' in a format of compressed text file.

Filename format: yymmddhhmmss.zdat.
For example, a data file created in 2014-07-05 23:27:49 will be named "140705232749.zdat".